# SAFETY ASPECT IN INSTALLATION INDUSTRIALIZED BUILDING SYSTEM (IBS) COMPONENT

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A report submitted in fulfillment of the requirements for the award of the degree of Bachelor Degree of Civil Engineering

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NOVEMBER 2009

I declare that this project report entitled “Safety Aspect in Installation Industrialized Building System (IBS) Component” is the result of my own research except as cited in the references. This report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date: …….

"Almighty Allah, please blessing to them….
My father, my mother, my brother, my young brother,
My lecturer, especially my supervisor Mr. Zahrizan B. Zakaria
My friends and to all muslim…..this is for us
Thanks you for your support"

## ACKNOWLEDGEMENT

First of all graceful thoughts all zillion thanks go to Almighty Allah (S.W.T) for giving me guidance and good health to complete the final year project (PSM). I want to extend my appreciation to everybody to who contributed to the accomplishment of this final year project. My final year project supervisor, Mr. Zahrizan B. Zakaria of the Faculty of Civil Engineering and Earth Resources is especially remembered for this time, patience and effort in 'moulding' me and my thought processes. The completion of this final year project would not have been possible without his conscientious guidance, advice and encouragement.

Furthermore, I am most thankful to my family for their continuous support and encouragement given to me unconditionally in completing this project report.

Eventually, I would like to express my sincere thanks to construction professionals, who generously spent their precious time to participate in the interviews of this project. Their honest information, opinions and comments are very useful indeed. My seniors and friends, who had provide all kinds of assistance and support, also deserved my special thanks. Without the contribution of all those mentioned above, this work would not have been possible.

# ABSTRACT

Safety aspect in construction is very importance and it has to apply to any construction project. It can be lead to accidence that could cause injured to workers as well the public and some causes can lead to death. Pre-cast construction also not exclude from having hazard in its construction process during the installation component. However, the most construction accidents occur because lack of proper planning, unsafe equipment, not follow the method statement, unsafe site conditions, not using the safety equipment that was provided, and poor attitude towards safety during installation process. The aim of this project is to study the process of installation component pre-cast concrete and to identify the safety aspect and the requirement during the process installation at site, included to identify the level of safety during installation process at site. The data was collected through documents study, interview, and industrial visit, constructed and distributed questionnaire in order to identify the safety requirements in pre-cast construction. All of the interview and research questionnaire survey are conducted among contractor that registered as class 7 with Construction Industrial Development Board (CIDB) and class A with Pusat Khidmat Kontraktor (PKK) in Klang Valley. Returned questionnaire were analyses with used average index and frequency analysis method to identify safety aspect using pre-cast construction. The results indicate that the safety aspect implemented by company involved in precast construction process is at a good level at safety aspect during bracing, propping, welding and grouting process and very good level at safety in general aspect and safety aspect during lifting process. This are a few safety aspect and requirement during installation process such as construction site workers equipped with personal protective equipment (PPE) and etc. In conclusion with existence of this study, it can boost up knowledge and give detailed information about safety aspect in Industrialized Building System using pre-cast concrete and must improve step of awareness until 0% of accident.

# ABSTRAK

Aspek keselamatan dalam pembinaan adalah sangat penting dan perlu dititikberatkan dalam mana-mana projek pembinaan. Ia akan membawa kepada kemalangan yang menyebabkan kecederaan yang serius kepada para pekerja atau orang awam malah kadang-kadang dapat membawa kepada kematian. Pembinaan pratuaang juga tidak terlepas daripada bahaya dalam kerja pembinaan semasa proses pemasangan. Bagaimanapun, kemalangan berlaku kerana kurang perancangan, peralatan yang tidak selamat, tidak mengikuti method statement, keadaan tapak yang tidak selamat, tidak menggunakan peralatan keselamatan yang disediakan, dan sikap yang lemah terhadap keselamatan semasa proses pembinaan. Matlamat projek ini ialah untuk mengkaji proses pemasangan komponen konkrit pratuang dan mengenalpasti aspek keselamatan dan keperluan semasa proses pemasangan di tapak bina termasuk mengenalpasti tahap keselamatan semasa process pemasangan di tapak bina. Data telah dikumpulkan melalui dokumen kajian, temuramah, dan melawat tapak, membuat dan mengedar borang kaji selidik untuk mengenalpasti keperluan keselamatan dalam pembinaan pratuang. Semua temuramah dan borang kaji selidik juga dijalankan kepada para kontaktor yang telah berdaftar sebagai gred 7 dengan Lembaga Pembangunan Industri Pembinaan (CIDB) dan kelas A dengan Pusat Khidmat Kontraktor (PKK) dalam kawasan lembah kelang. Pemulangan Boring kaji selidik akan dianalisis dengan kaedah indek purata dan kaedah kekerapan untuk mengenalpasti aspek keselamatan dalam pembinaan pratuang. Keputusan menunjukkan aspek keselamatan yang diamalkan oleh syarikat yang terlibat dalam proses pembinaan pratuang adalah di tahap bagus pada aspek keselamatan semasa merembat, propping, kimpalan dan grouting dan tahap sangat bagus pada aspek keselamatan secara umum dan aspek keselamatan semasa proses mengangkat. ini adalah sebahagian aspek keselamatan dan keperluan semasa proses pemasangan seperti pekerja ditapak bina dibekalkan dengan peralatan perlindungan peribadi (PPE) and lain-lain lagi. Kesimpulannya dengan adanya kajian ini, dapat menambahkan pengetahuan tentang aspek keselamatan dalam “Industrialized Building System”menggunakan konkrit pratuang dan langkah keselamatan perlu dipertingkatkan sehingga 0% kemalangan yang berlaku.

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IBS – Industrialized Building System
CIDB - Construction Development Board Malaysia
SOCSO - Social Security Organization
DOSH - Department of Occupational Safety andHealth
AHP – Analysis Hierarchy Process
LRT - Light Rail Transport
PKK - Pusat Khidmat Kontraktor
PKNS – Perbadanan Kemajuan Negeri Selangor
A.I – Average Index
CMU - Concrete Masonry Unit
HIRARC - Hazard Identification Risk Assessment Risk Control
PPE - Personal Protection Equipment

# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

A Pre-cast construction is classified as a one of the Industrialized Building System (IBS). However, Industrialized Building System (IBS) is not a new concept construction in Malaysia. Pre-cast construction is one of the construction method where the component is being produced factory or site lift off and attach be a building structure. Pre-cast concrete elements are concrete products that are manufactured and cured in a plant environment and then transported to a job site for installation. This method has its own significance and deficiency. Other that, safety aspect in construction is very importance and it has to apply to any construction project. Safety is an issue that has no end and every year will have accidents occurred at site construction. However, it can be lead to accidence that could cause injured to workers as well the public and some causes can lead to death.

Pre-cast construction also not exclude from having hazard in its construction process during the installation component. This method is less popular compare with conventional because of this phenomena, most contractor still not fully understand safety aspect when used the pre-cast in construction. Pre-cast method construction is different from ordinary method.

Pre-cast who do their own installations knows there are procedures required to achieve a high level of quality, customer satisfaction and most importance safety. Since the installation process are unique, the procedure may vary and become complex. To make installation run smoothly it is best to have experienced workers. Plan should take the initiative and train employees, developing them into highly skilled installer. This goes for foremen, welders, crane operators and whole crew. If procedures are kept simple and consistent, installation workers can achieve safe and cost effective installation.

Pre-cast concrete buildings were introduced in Malaysia in 1966 when the government launched two pilot projects for pre-cast houses. The construction of Tuanku Abdul Rahman Flats in Kuala Lumpur and the Rifle Range Road Flats in Penang were the first time that pre-cast concrete elements were used to construct mass houses (CIDB Digest, 2005). The Social Security Organization (SOCSO) record shows that a total of 4654 out of 73858 industrial accidents recorded in 2003 were come from the construction industry. (Mohammed Taher Alashwal, 2008) but it different if used precast concrete, the statistic from CIDB shows the accidents are 50% from heavy lifting, 20% installation, 10% other factor, and more 10% from during transportation component to storage accidents.

## 1.2 Background Study

Industrialized building system is not new concept in Malaysia. One of the common divisions in construction industry is the Industrial Building System (IBS) which has been introduced in Malaysia since 1966 for the projects which involve pre-cast construction. According to Construction Industry Development Board Malaysia there are five types of the IBS used in Malaysia:

1. Pre-Cast Concrete Framing, Panel and Box Systems.

2. Steel Formwork Systems.
3. Steel Framing System.
4. Prefabricated Timber Framing Systems.
5. Block Work Systems.

(Ahmad Baharuddin, 2006).

Pre-cast component come in a variety of shape for different of usage, both architecture and structure. It included the traditional pre-cast beam, column, slab, wall and usage of pre-cast element eliminates or greatly reduces conventional formwork and props. Pre-cast construction also lessens the problem of site wastages and the related environmental problem. The prefabricated also provide a safe working platform for workers to work on. Workers and material are also greatly reduced at the construction site. The most importance aspect of an installation is the safety of your workers and anyone on or near the jobsite. Installer must have a detailed safety procedure in their method of installation that meets all Department of Occupational Safety and Health (DOSH). Other than, crane operator also must be certified to meet DOSH requirements (Rofizlan Ahmad, 2001).

The construction industry knows as one of the most hazardous activities (C.R Che Hassan, O.J Basha,W.H Wan Hanafi, 2007). There are many hazards and risks associated with these five types of IBS at every stage of the construction process starting from the manufacturing stage to the erection stage. In every stage there are regulations and requirements to provide safety environment at the work place that has to be met.

## 1.3 Problem Statement

Industrialized Building System (IBS) is believed to be relatively not a new approach in Malaysia. However, the most precast construction accidents occur

because lack of proper planning, unsafe equipment, not follow the method statement, unsafe site conditions, not using the safety equipment that was provided, and poor attitude towards safety during installation process. Therefore, it indicated that there is lack of consideration of safety and risk evaluation in IBS construction. Besides that, the safety performance in the Malaysian construction industry has lagged behind most other industries as evidenced by its disproportional high rate of accidents as mentioned earlier in this study.

Furthermore, accident statistics can play an important role as a prime indicator for measuring safety performance as well as a framework for evaluating accident prevention program. However, the statistics of accidents occurred in the Malaysian construction sector have not been well organized and maintained. In addition, the assessment of the cost to provide safety in IBS construction is also unknown. Carelessness can lead to accidence that could cause injured to workers as well the public and some causes can lead to death. Among accident happen, to identify when workers fall current process installation component at high place and death causes crushed from component pre-cast current working. The hazards associated with pre-cast installation procedure can be very different from other type of works at site. (Rofizlan Ahmad, 2001).

## 1.4 Objective

The aim of this study is to provide a general perspective of safety in pre-cast concrete construction. The specific objectives of this study are as follows:

1. To study the process of installation component pre-cast concrete and manufacturing pre-cast element and
2. To identify the safety aspect and the requirement during the process installation at site.

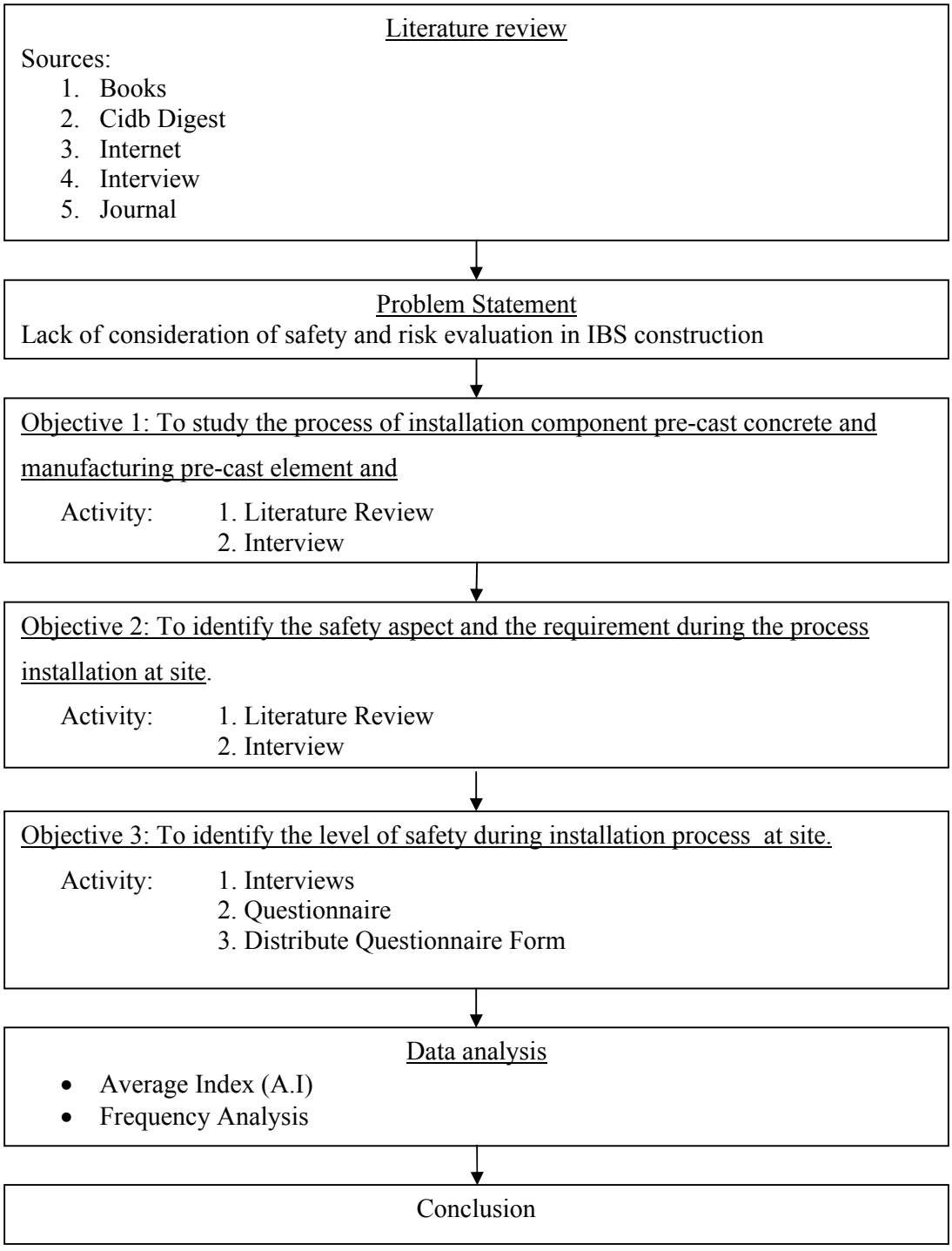
3. To identify the level of safety during installation process at site.

## 1.5 Scope of Study

The scope of this study is focused on element of Industrialized Building System (IBS) method and safety in IBS constructions specific in pre-cast concrete construction. The study is about the site safety in pre-cast concrete construction (installation stage) where the most of construction accidents happened and it the study area is Klang Valley. The data collected in this study are mainly from the companies' safety manuals documents study, case studies, questionnaire and interviews. The aspects being consider are:

1. This study is focus about pre-cast concrete as part of IBS element.
2. This study is focus about process installation pre-cast at the site (site safety).
3. This study is focus in manufacturing process for pre-cast concrete.
4. The respondents are the register as class A contactors with Pusat Khidmat Kontraktor (PKK).
5. The respondents are the register as grade 7 contactors with Construction Industry Development Board (CIDB).
6. The area of this study is in Klang Valley.

## 1.6 Methodology



## 1.7 Significant Of Study

The construction industry now is facing challenges in four aspects; time, cost, quality and safety. Actually, safety is one of the most important factors in construction industry where it will affect the time, cost and quality of any construction project.

Thus, this study will help to measure the safety in Industrialized Building System (IBS). Moreover, the compliance of the safety regulations coupled with the knowledge of safety provides advantages to the construction companies. It decreases of accidents and the project can be completed with high quality within the given time.

## 1.8 Expected Outcome

At the end of this course, the contactor should have at least a basic knowledge on the safety aspect and know their responsibility. Contractor can know safety aspect and requirement at site its ok or not.

# CHAPTER 2

# LITERARURE REVIEW

## 2.1 Introduction

This chapter explains about the process of installation component precast concrete and manufacturing pre-cast element and to identify the safety aspect and the requirement during the process installation at site and to identify the level of safety during installation process at site.

For this chapter, definition and description of Industrialized Building System (IBS) will be given. Beside that this chapter also included history about IBS in Malaysia, process installation, safety procedure when do the installation and etc.

### 2.1.1 Industrialized Building System (IBS)

IBS is stand for Industrialized Building System. In general, the construction methods can be classified into four categories:-

1. Conventional method
2. Cast in situ
3. Composite method
4. Fully fabricated

(Badir And Razali, 1998).

There are a few definitions of IBS according to few researchers. Those definitions are as stated in table 2.1:

**Table 2.1**: Definitions of IBS

| References | Definition |
|---|---|
| Lessing et al, 2005 | IBS as an integrated manufacturing and construction process with well planned organization for efficient management, preparation and control over resources used, activities and results supported by the used of highly developed components. |
| CIDB , 2003 | IBS is define as a construction system which components are manufactured in a factory or off site, positioned and assembled into structure with minimal additional site work. |
| Warszawski, 1999 | IBS also defined as a set of interrelated element that act together to enable the designated performance of the building. |
| Trikha, 1999 | IBS as a system in which concrete component prefabricated at site or in factory assembled to form the structure with minimum in situ construction. |
| Esa And Nurudin, 1998 | IBS is a continuum beginning from utilizing craftsmen for every aspect of construction to a system that make use of |

| | |
|---|---|
| | manufacturing production in order to minimize resource wastage and enhance value end users. |
| Parid Wardi , 1997 | IBS as a system which use industrialized production technique either in the production of component or assembly of the building or both. |
| Junid, 1986 | IBS as process by which components of building are conceived, planned and fabricated, transported and erected at site. The system includes balanced combination between software and hardware components. The software element includes system design, which is complex process of studying the requirement of the end user, market analysis and the development of standardized components. |
| Dietz, 1971 | IBS as total integration of all subsystem and components into overall process fully utilizing industrialized productions, transportation and assembly techniques. |

Hence, from my reading it can say that Industrialized Building System (IBS) is a process whereby the pre-cast concrete elements are concrete products that are manufactured or at site and cured in a plant environment and then transported to a job site for installation to be assemble together to form a building.

Other that, it is interesting to note that the term “Industrialized Building System” (IBS) is often misinterpreted as systems limited only for construction of building. In fact, IBS covers all types of structures as the word “building” actually relates to “construction”(Shaari and Elias, 2003).